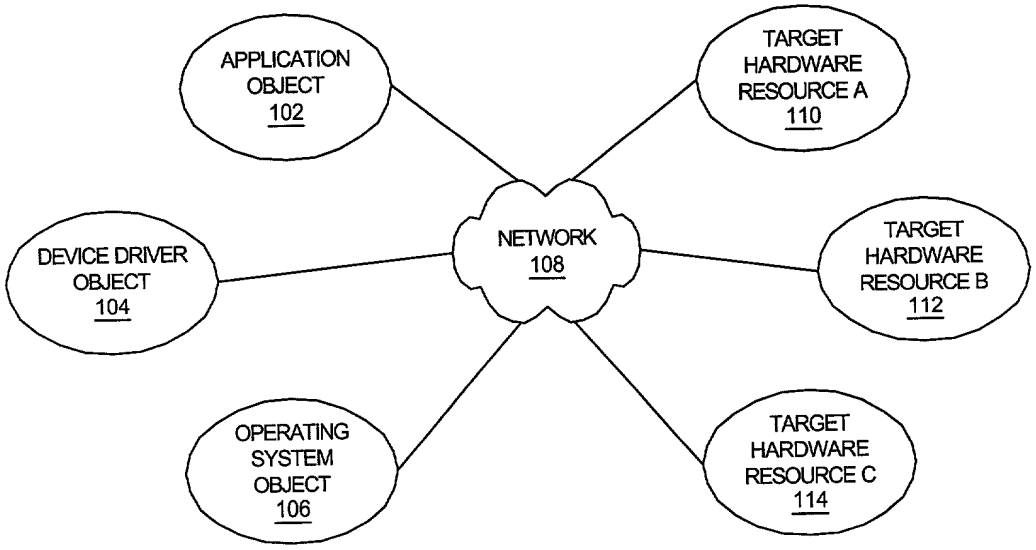
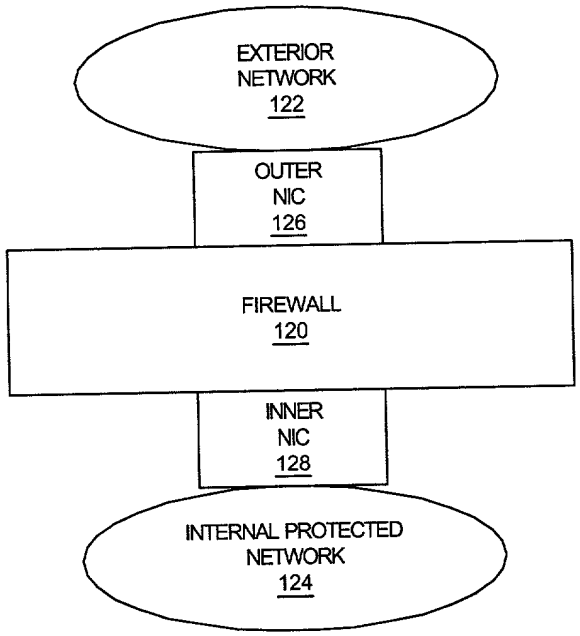



Prior Art

Figure 1A




Prior Art

Figure 1B

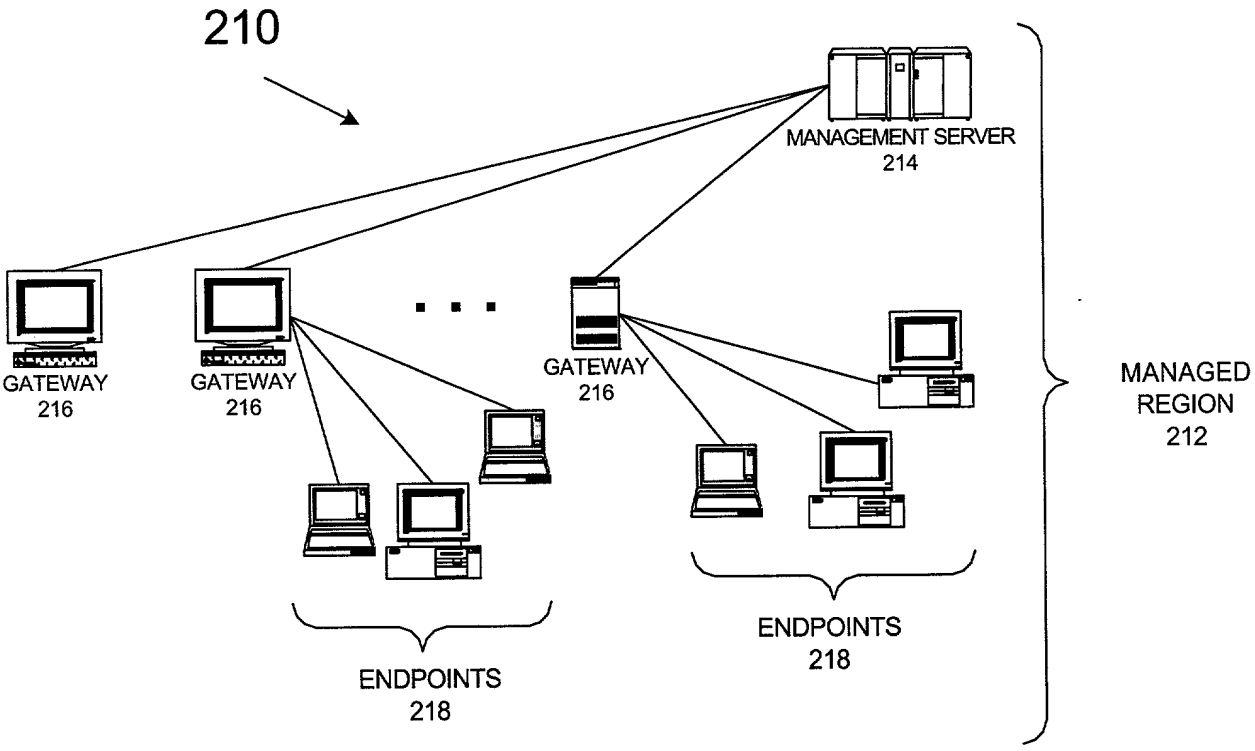

210
MANAGEMENT SERVER
214
GATEWAY
216
GATEWAY
216
GATEWAY
216
ENDPOINTS
218
ENDPOINTS
218
MANAGED
REGION
212

Figure 2A

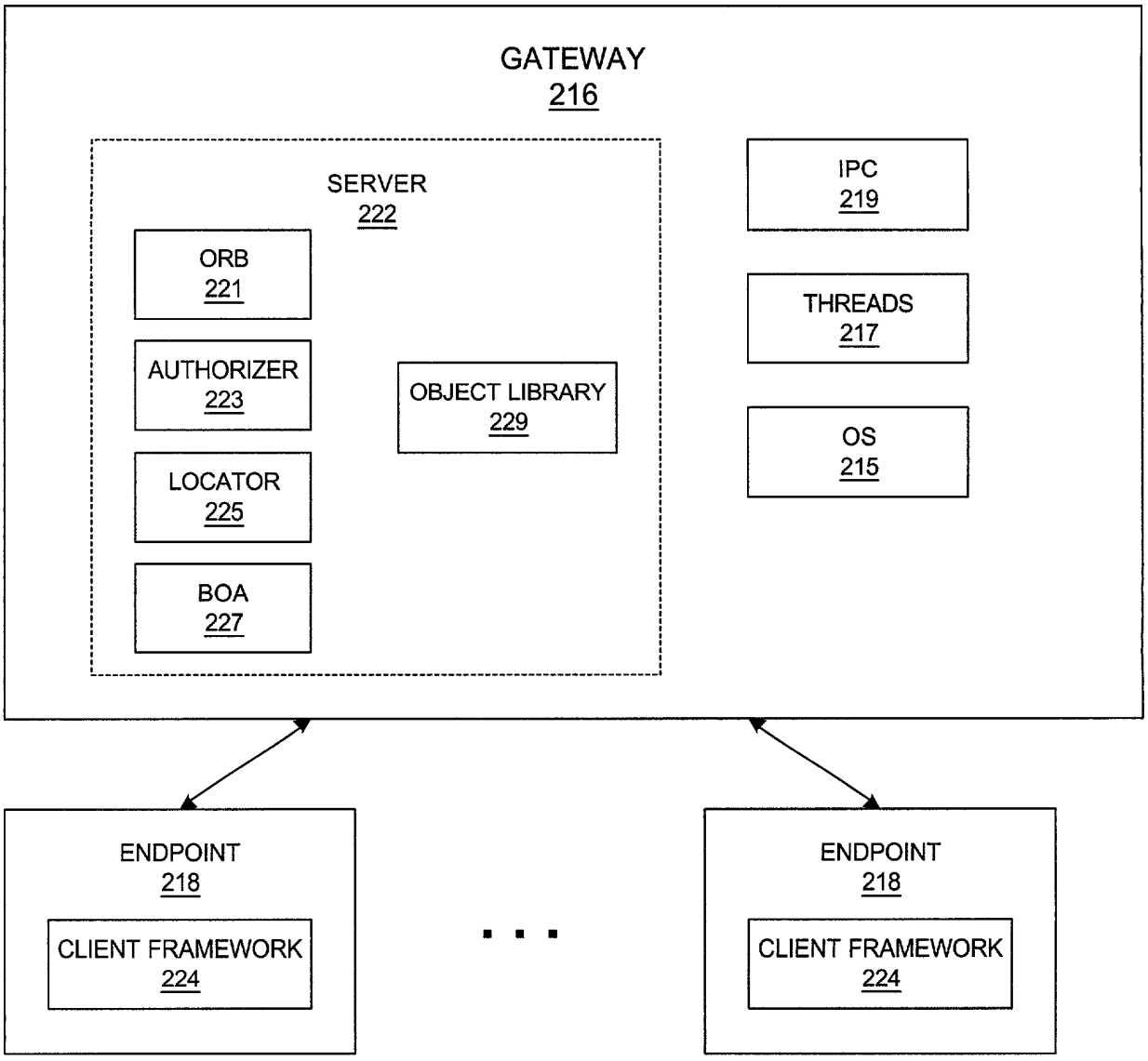



Figure 2B

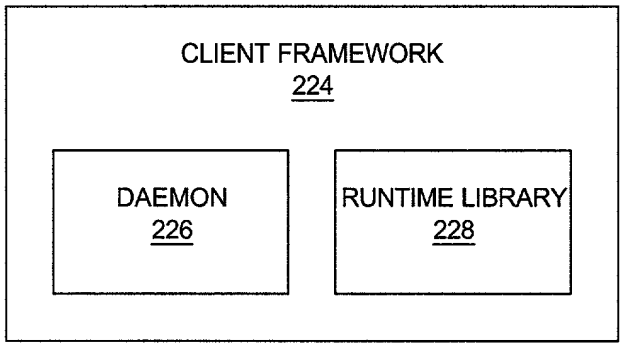



Figure 2C

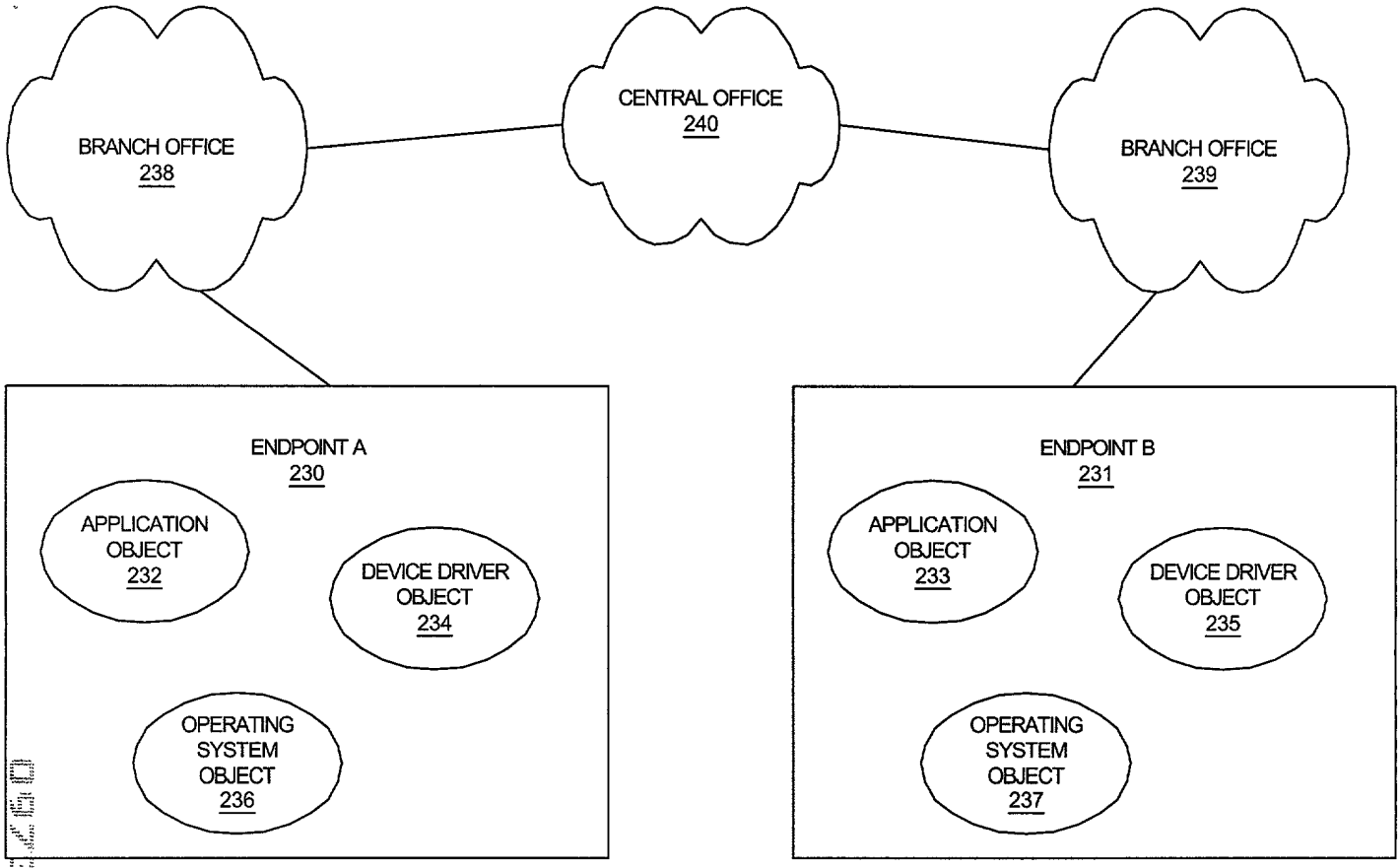



Figure 2D

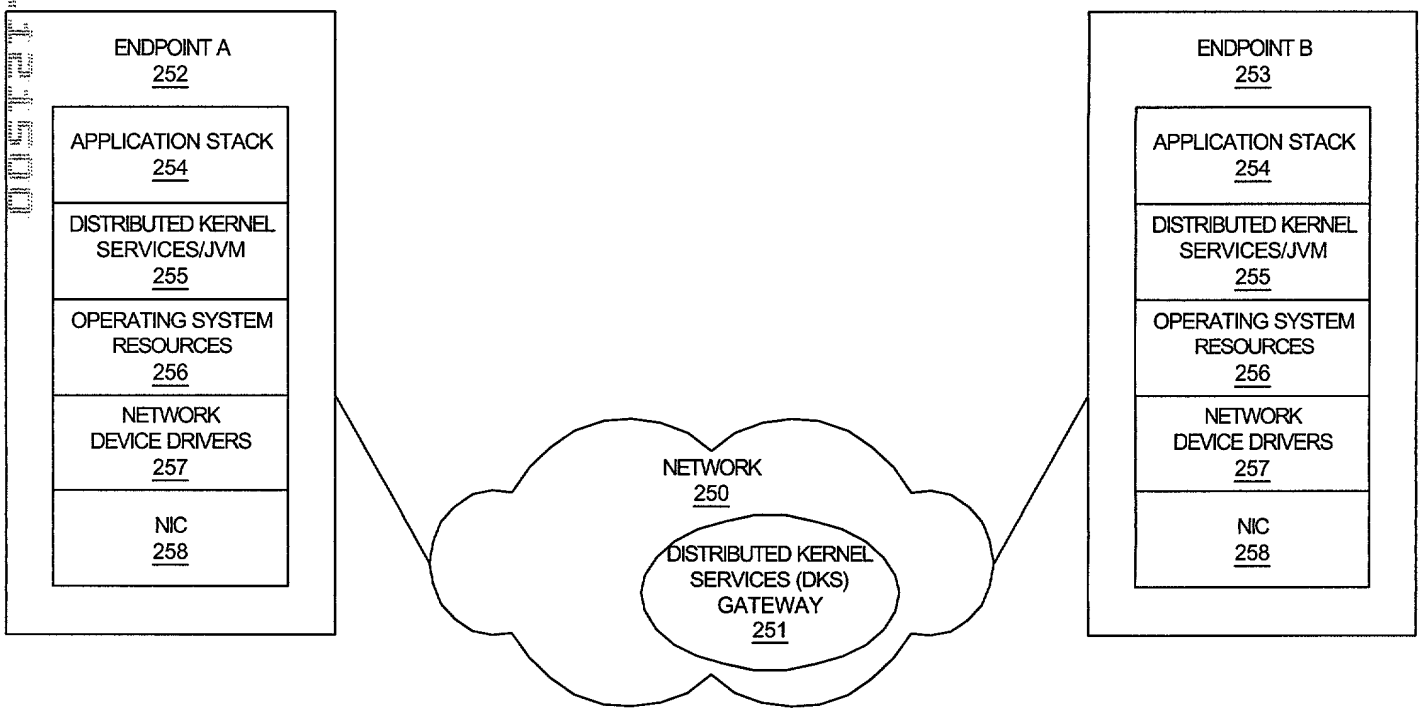



Figure 2E

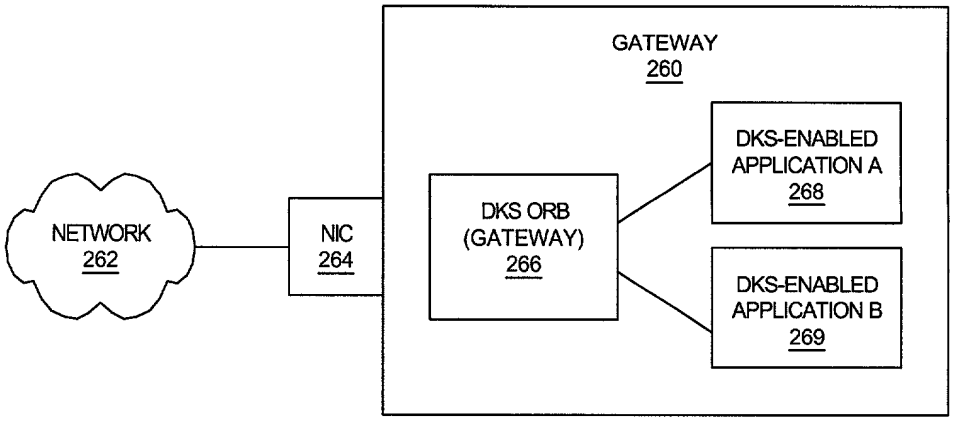



Figure 2F

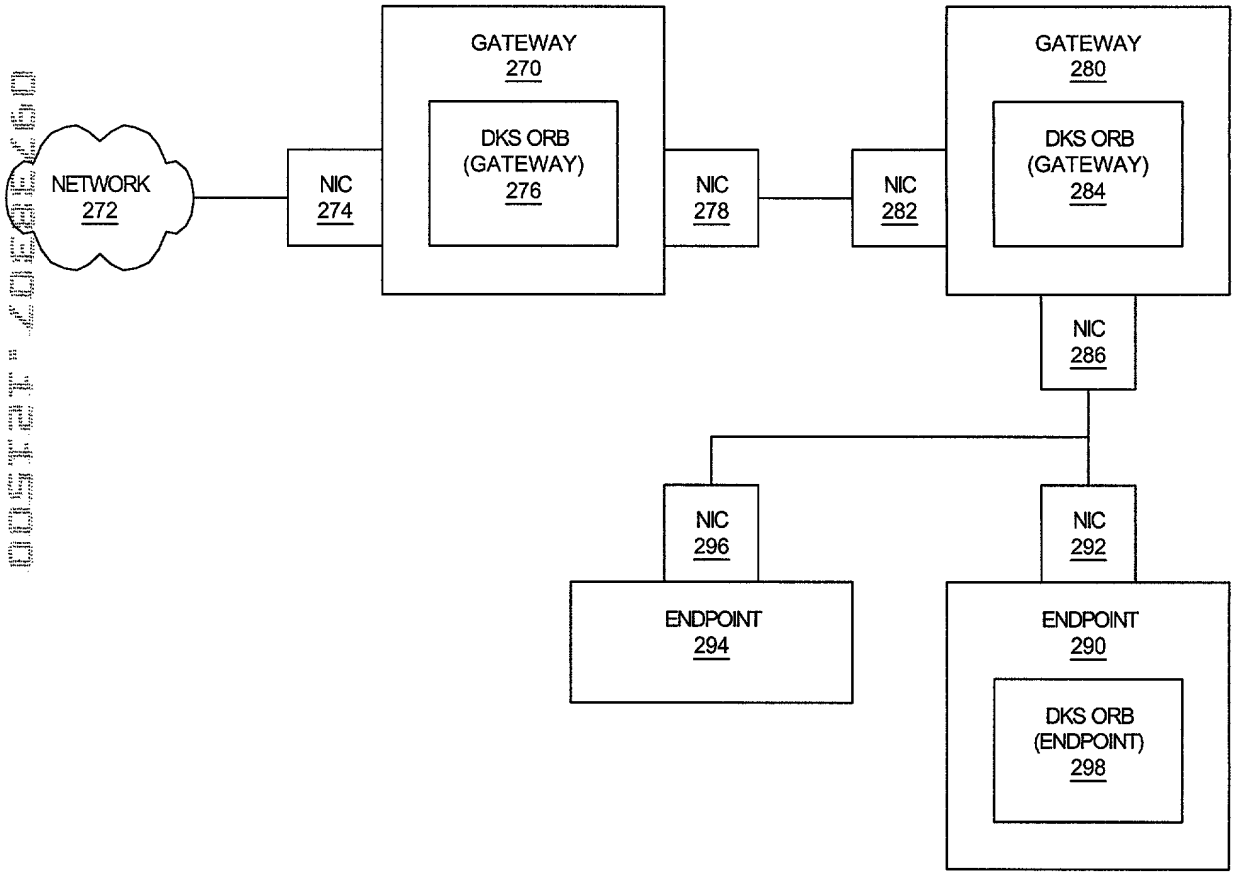



Figure 2G

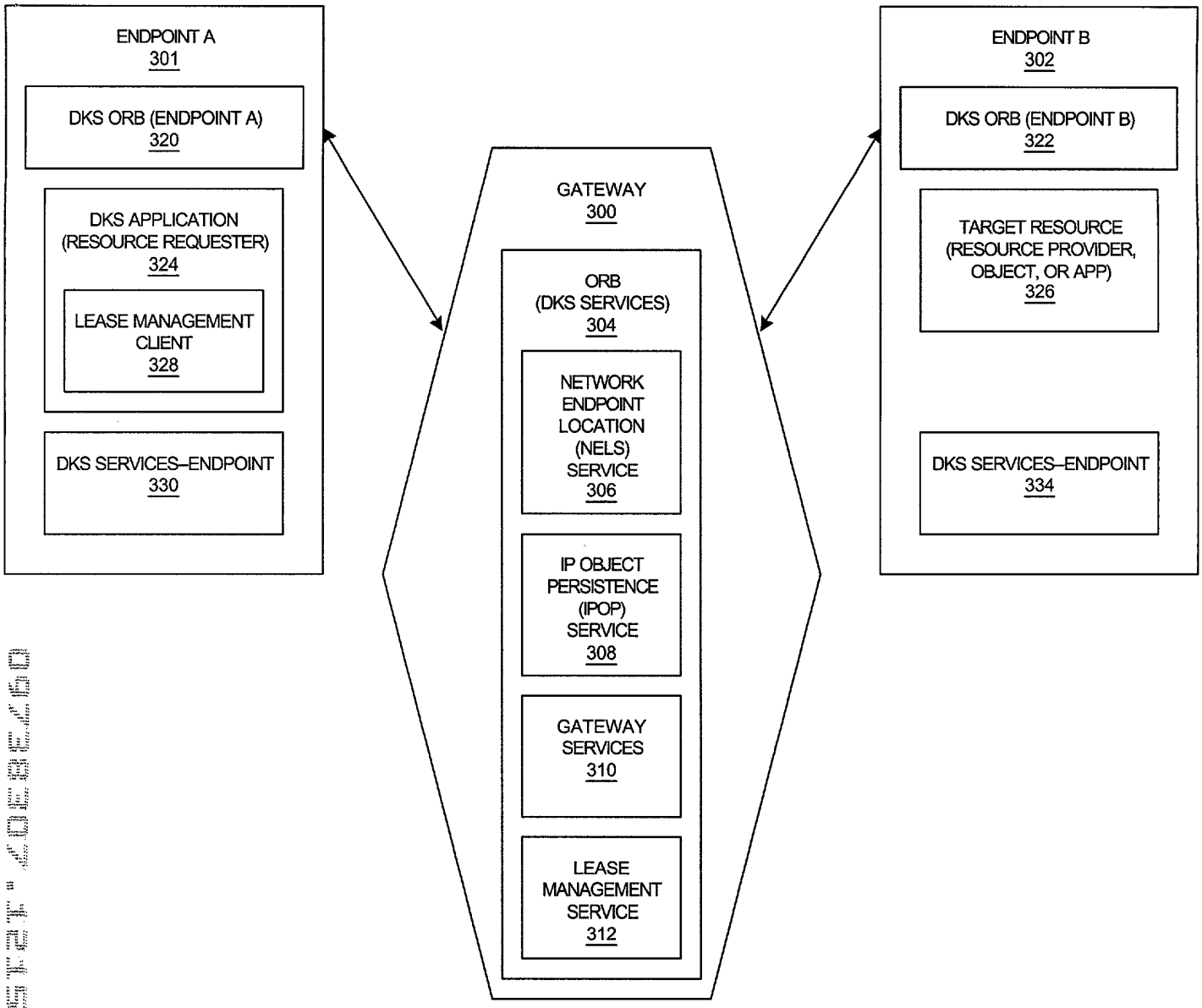



Figure 3

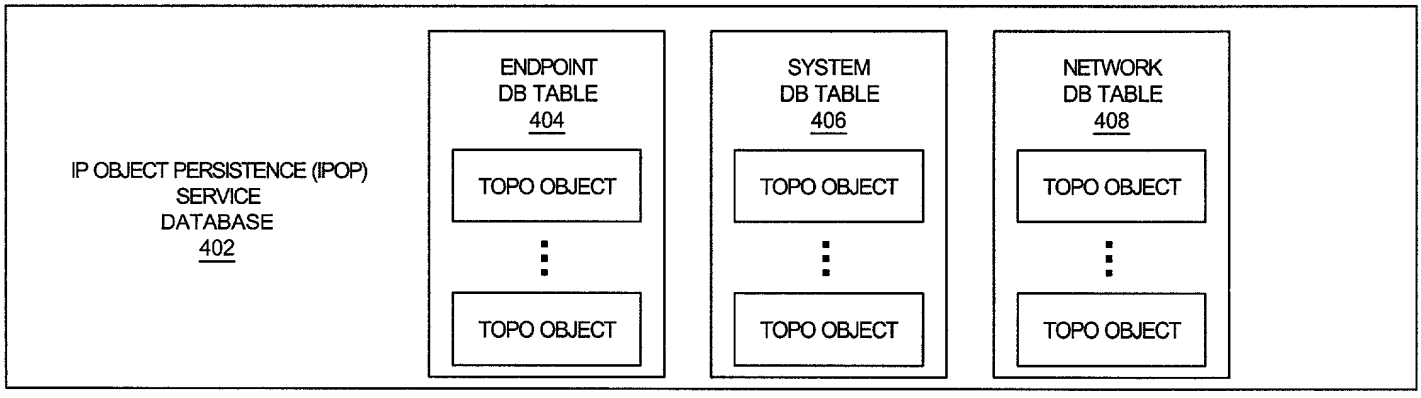



Figure 4

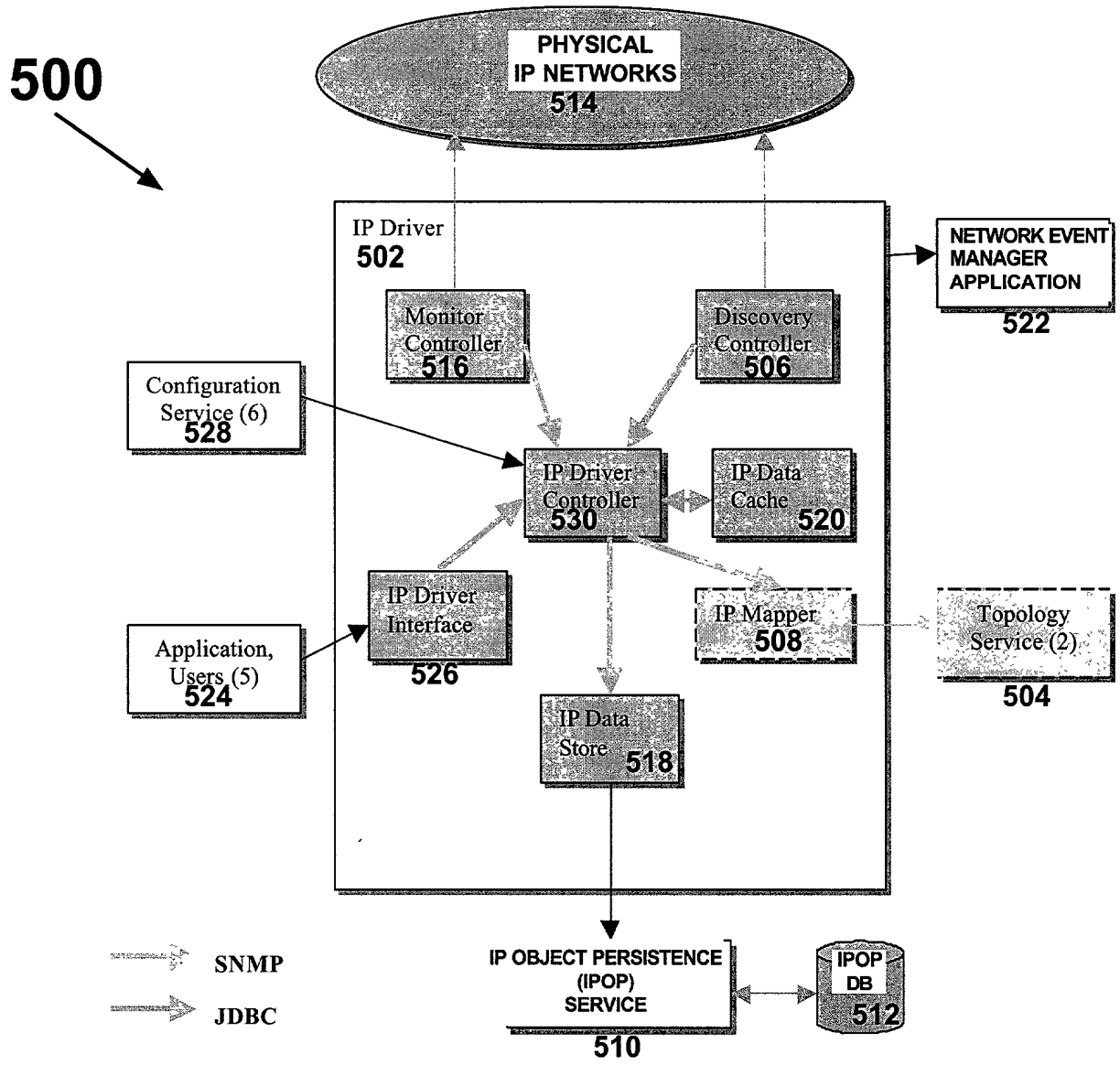

500
PHYSICAL
IP NETWORKS
514
IP Driver
502
Monitor
Controller
516
Discovery
Controller
506
NETWORK EVENT
MANAGER
APPLICATION
522
Configuration
Service (6)
528
IP Driver
Controller
530
IP Data
Cache
520
IP Driver
Interface
526
IP Mapper
508
Topology
Service (2)
504
Application,
Users (5)
524
IP Data
Store
518
SNMP
JDBC
IP OBJECT PERSISTENCE
(IPOP)
SERVICE
510
IPOP
DB
512

Figure 5

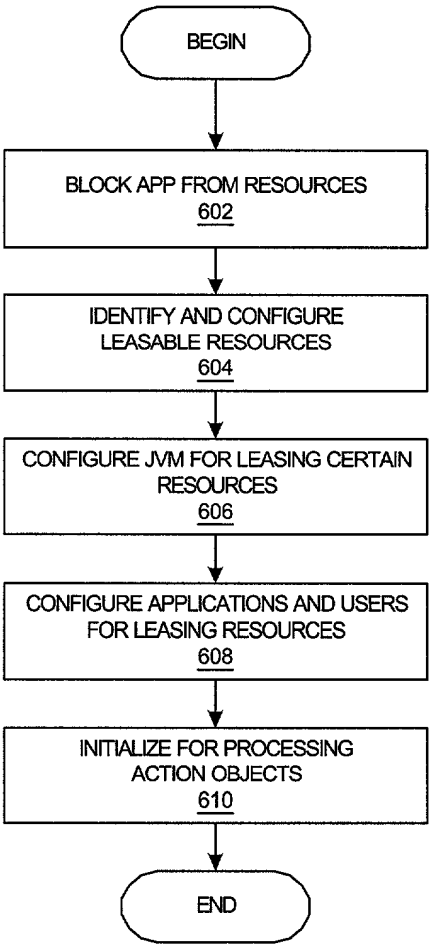



Figure 6A

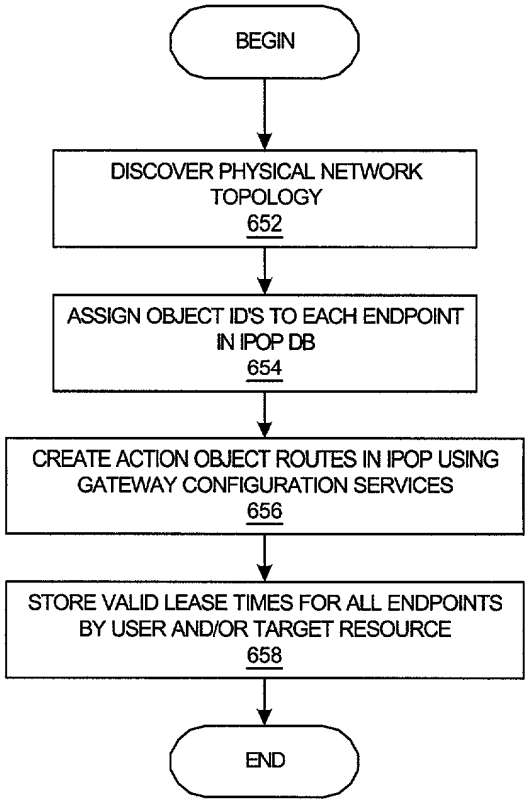



Figure 6B

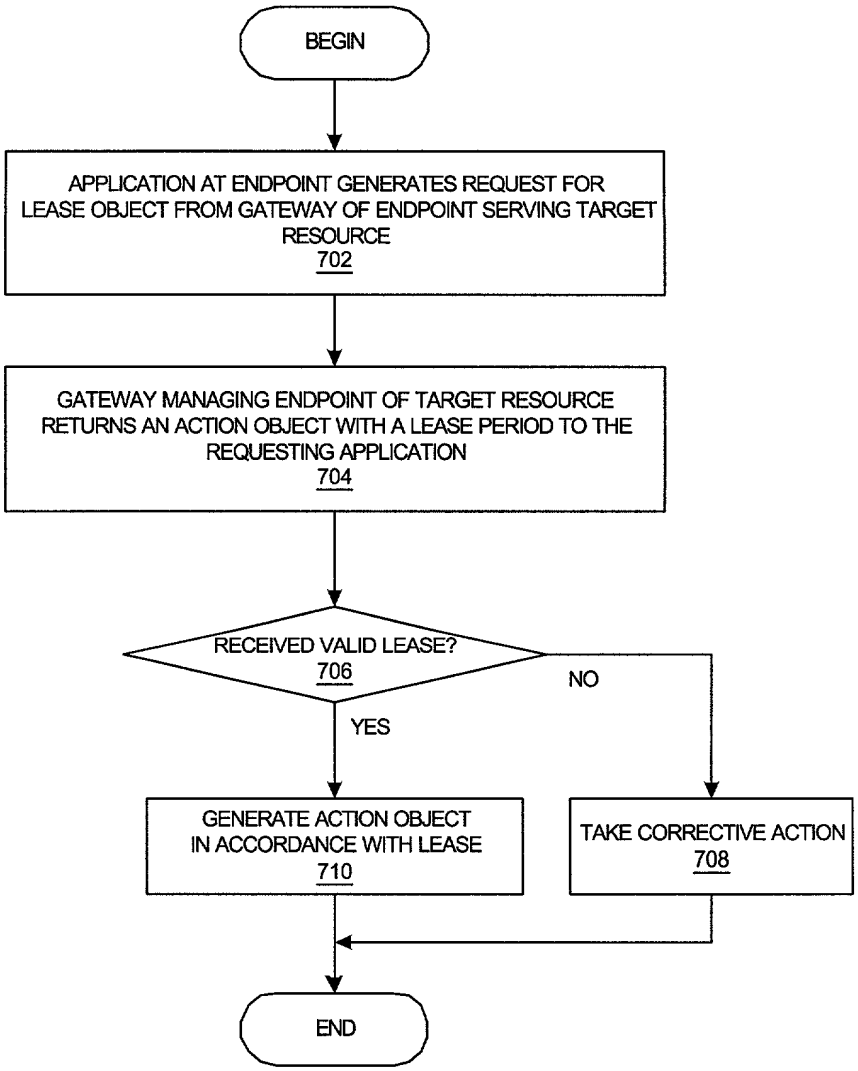



Figure 7A

```
CLASS  ACTION_OBJECT  {

        // CONSTRUCTOR
        ACTION_OBJECT( LONG IPADDRESS, SHORT VIRTUALPRIVATENETWORKADDRESS )
                THROWS BADADDRESS ...
        .
        .
        .
        VOID PERFORMACTION( ) // EXECUTES ACTION METHOD
.
.
.
}
```

Figure 7B

```
CLASS  LEASE_ACTION_OBJECT  EXTENDS ACTION_OBJECT {

        // CONSTRUCTOR
        LEASE_ACTION_OBJECT( LONG IPADDRESS, SHORT VIRTUALPRIVATENETWORKADDRESS,
                             INT LEASETIME)
                THROWS       BADADDRESS, LEASETIMENOTACCEPTABLE_EXCEPTION,
                             LEASEBANDWIDTHMUSTBEREDUCED_EXCEPTION,
                             LEASETERMINATED_EXCEPTION, ...

        .
        .
        .

        PUBLIC INT LEASETIME;        // STORE LEASE TIME

        STATIC FINAL INFINITELEASETIME = -1;
        STATIC FINAL ZEROLEASETIME = 0;
.
.
.
}
```

Figure 7C

```
CLASS  LEASETIMENOTACCEPTABLE_EXCEPTION  EXTENDS EXCEPTION {
.
.
.
}

CLASS  LEASEBANDWIDTHMUSTBEREDUCED_EXCEPTION  EXTENDS EXCEPTION {
.
.
.
}

CLASS  LEASETERMINATED_EXCEPTION  EXTENDS EXCEPTION {
.
.
.
}
```

Figure 7D

```
XYZ_APPLICATION_METHOD {
        LEASE_ACTION_OBJECT        MYLEASEDACTIONOBJECT = NULL;
        .
        .
        .
        MYLEASEDACTIONOBJECT = NEW LEASEDACTIONOBJECT( . . . );
        MYLEASEDACTIONOBJECT.PERFORMACTION( . . . );
.
.
.
}
```

Figure 7E

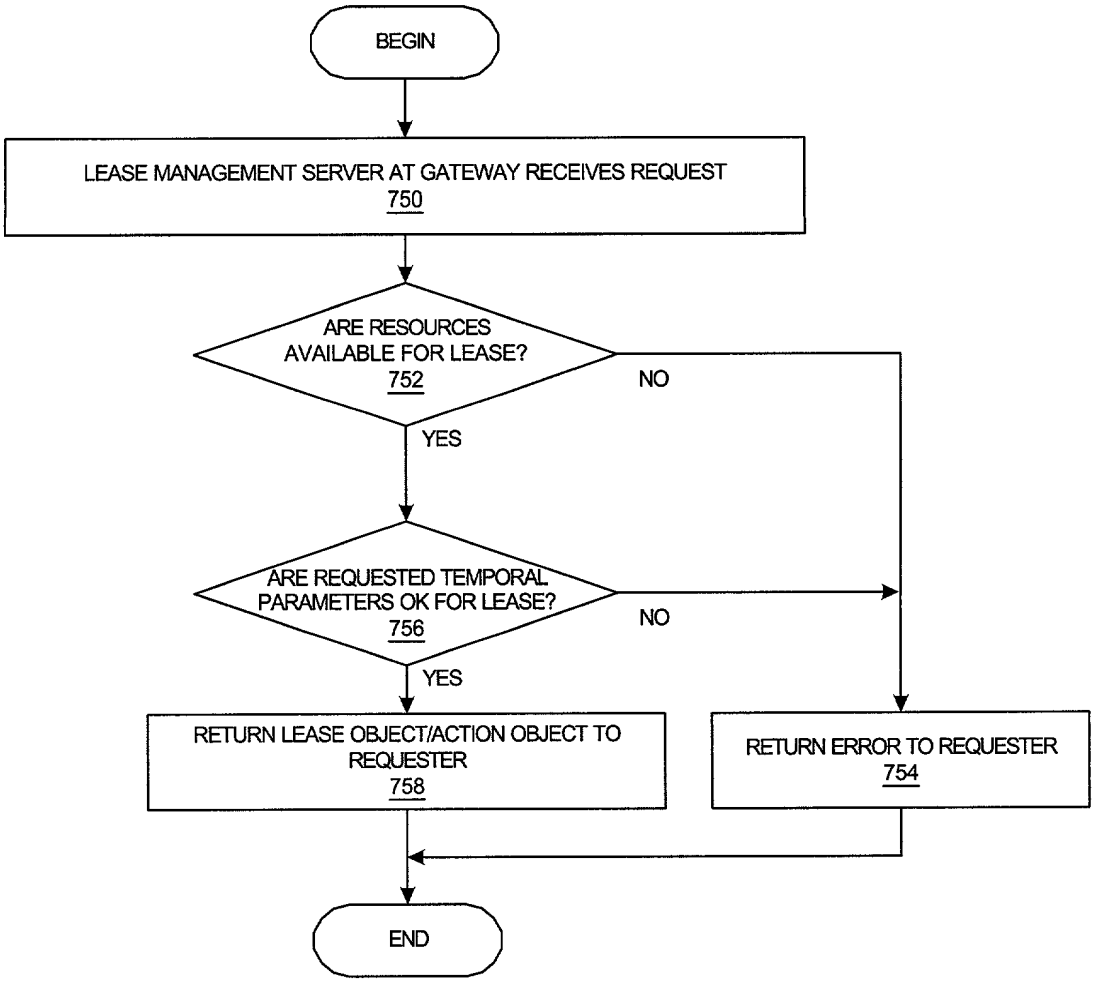

BEGIN
LEASE MANAGEMENT SERVER AT GATEWAY RECEIVES REQUEST
750
ARE RESOURCES AVAILABLE FOR LEASE?
752
NO
YES
ARE REQUESTED TEMPORAL PARAMETERS OK FOR LEASE?
756
NO
YES
RETURN LEASE OBJECT/ACTION OBJECT TO REQUESTER
758
RETURN ERROR TO REQUESTER
754
END

Figure 7F

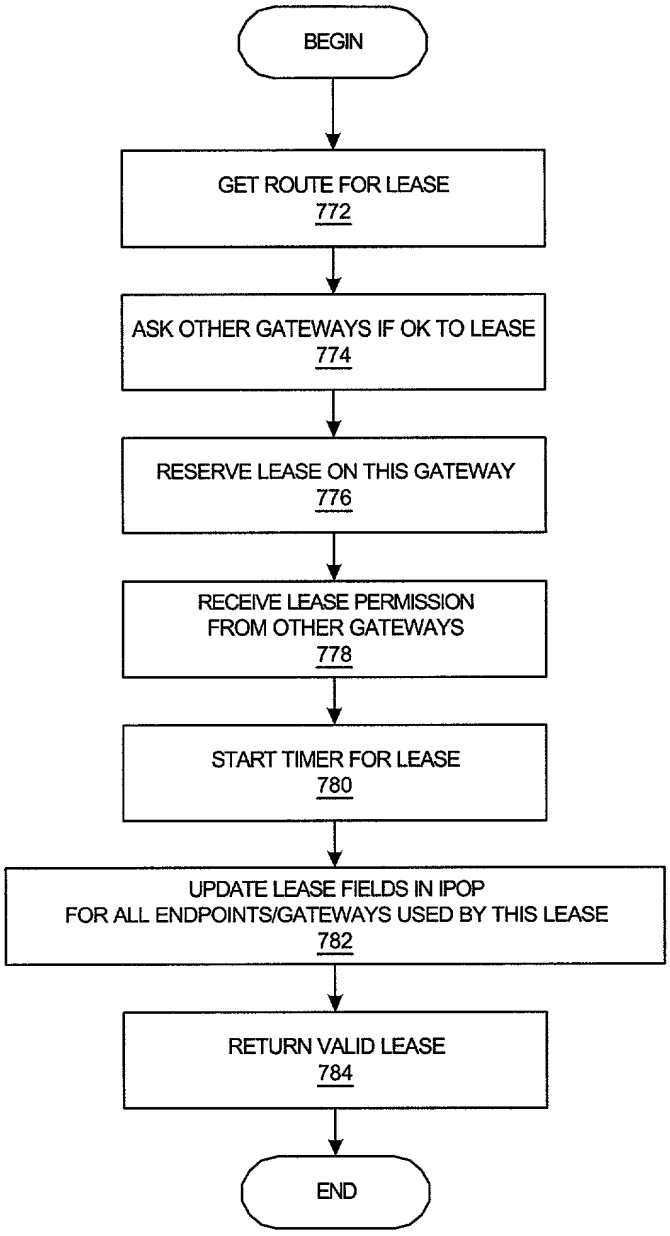

BEGIN
GET ROUTE FOR LEASE
772
ASK OTHER GATEWAYS IF OK TO LEASE
774
RESERVE LEASE ON THIS GATEWAY
776
RECEIVE LEASE PERMISSION
FROM OTHER GATEWAYS
778
START TIMER FOR LEASE
780
UPDATE LEASE FIELDS IN IPOP
FOR ALL ENDPOINTS/GATEWAYS USED BY THIS LEASE
782
RETURN VALID LEASE
784
END

Figure 7G

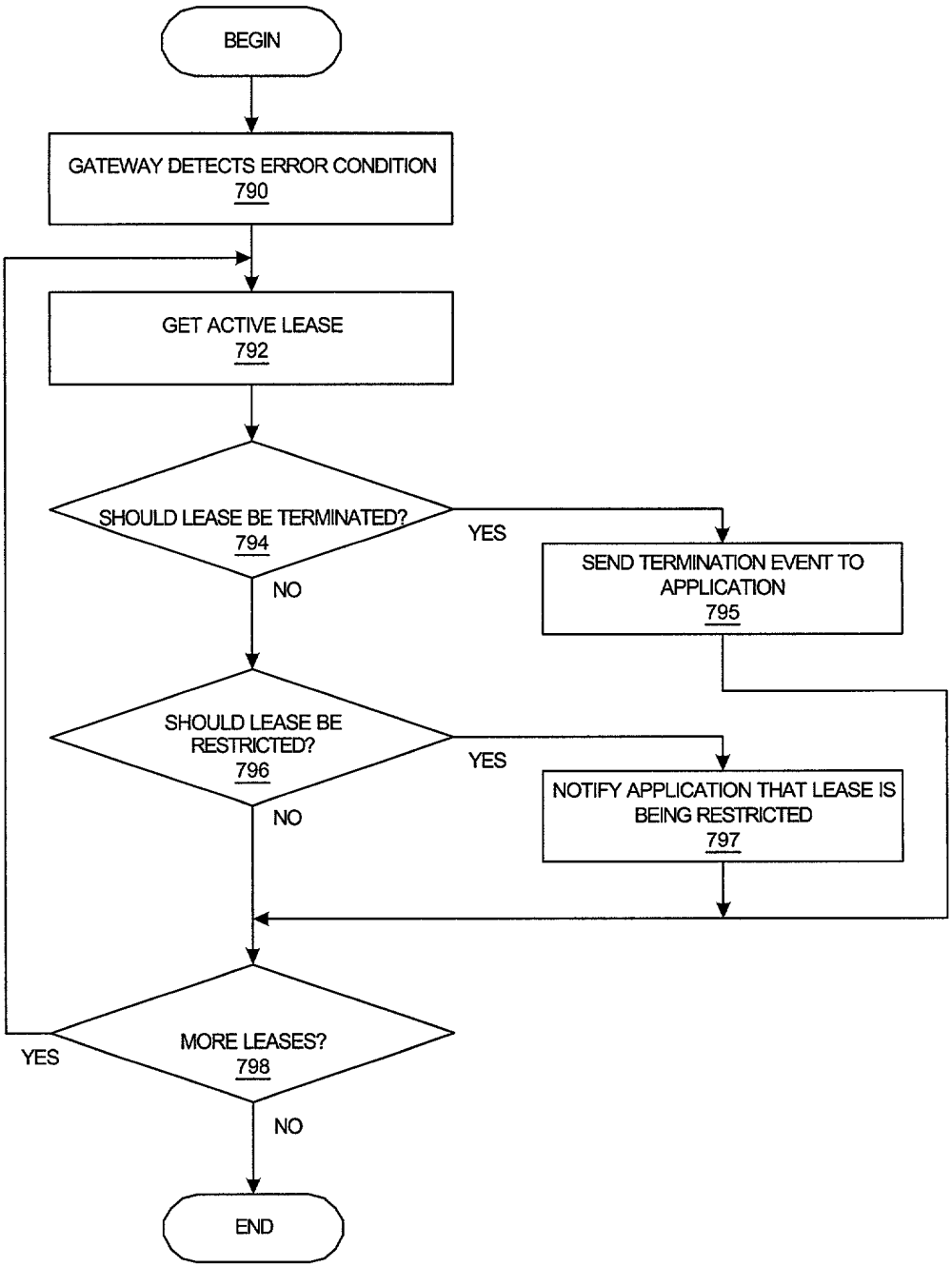

BEGIN
GATEWAY DETECTS ERROR CONDITION
790
GET ACTIVE LEASE
792
SHOULD LEASE BE TERMINATED?
794
YES
NO
SEND TERMINATION EVENT TO APPLICATION
795
SHOULD LEASE BE RESTRICTED?
796
YES
NO
NOTIFY APPLICATION THAT LEASE IS BEING RESTRICTED
797
MORE LEASES?
798
YES
NO
END

Figure 7H

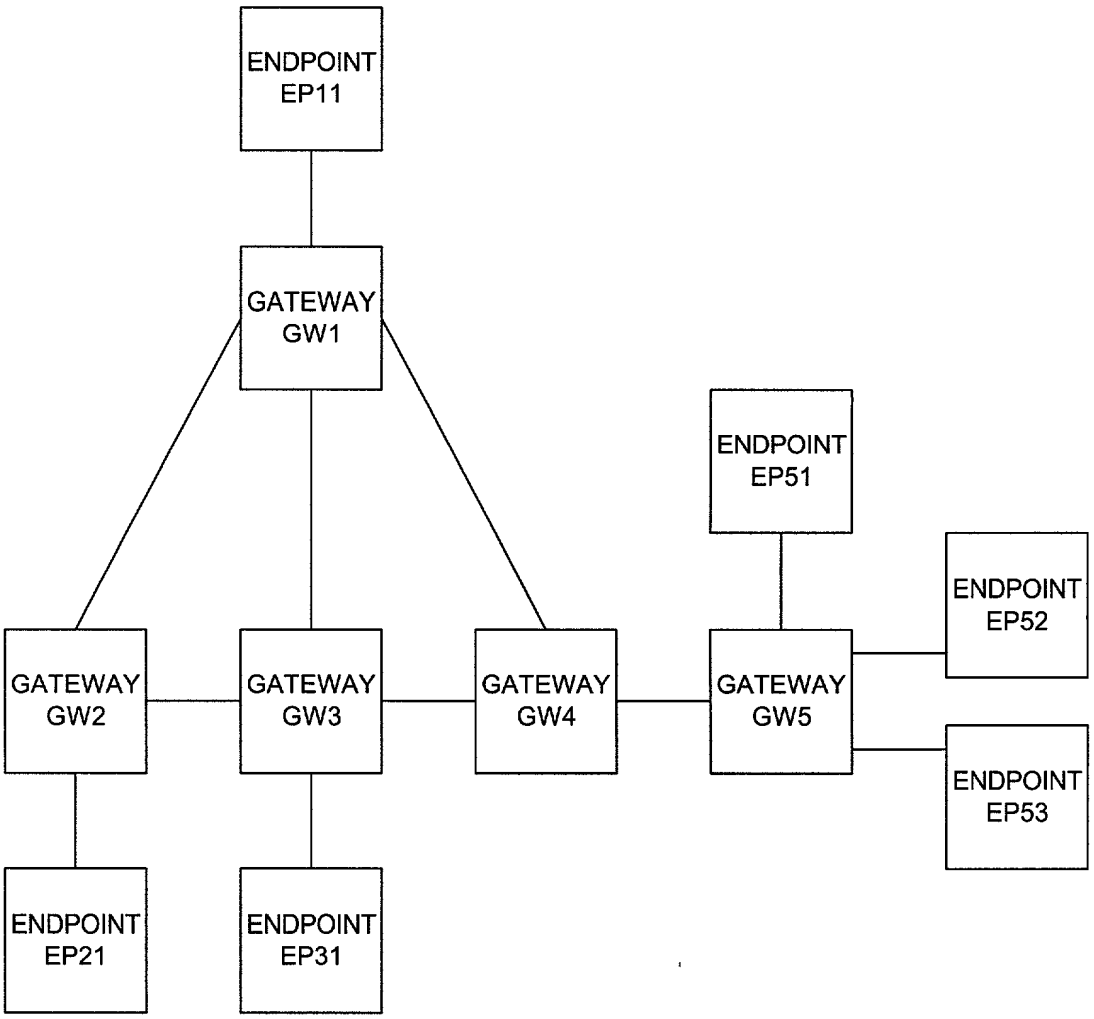

ENDPOINT
EP11
GATEWAY
GW1
ENDPOINT
EP51
ENDPOINT
EP52
GATEWAY
GW2
GATEWAY
GW3
GATEWAY
GW4
GATEWAY
GW5
ENDPOINT
EP53
ENDPOINT
EP21
ENDPOINT
EP31

Figure 8